2.0 ENVIRONMENTAL SETTING

2.1 PRESENT CONDITIONS

The project area is located on Coastal Plain physiographic province at the northern end of the Drainage Divide physiographic zone as defined by Custer (1986). The sites lay at the headwaters of Sandy Branch and drain westward into the Bohemia River and ultimately into the Chesapeake Bay. Aspect within the sites was flat with elevation ranging from 15 meters (m) above mean seal level (amsl) at Site 7NC-F-122 to the south to 18 m amsl at Site 7NC-F-126 at the northern end of the project area (see Figure 1-2, pg. 1-3).

The soils within the vicinity of the project area formed on a mostly Pleistocene Columbia Formation base, composed primarily of sand and gravel deposited over Cretaceous-age clays, silts, and fine sands as a result of glacial outwash from melting continental ice sheets (Groot and Jordan 1999). The Soil Survey of New Castle County (Matthews and Lavoie 1970; United States Department of Agriculture [USDA], Natural Resources Conservation Service [NRCS], Web Soil Survey [WSS] 2011) indicates that the project area contains soils of the Matapeake-Sassafras Association. These soils are described as occurring in well-drained uplands and interfluves with medium to moderately coarse texture. The soils are generally well drained with a depth-to-water table of more than 200 centimeters (cm). The specific soils present at each site are as follows:

Site	***Series***	***Slope***
7NC-F-122	Reybold silt loam (ReB) & Sassafras sandy loam (SaD)	2-5 percent
7NC-F-124	Reybold silt loam (ReA)	2-5 percent
7NC-F-126	Reybold-Queponco complex (RdA)	0-2 percent

At the time of investigation, crop cover at Site 7NC-F-122 consisted of waist-high green wheat; Site 7NC-F-124 was in corn; and Site 7NC-F-126 was in double crop with wheat having been recently harvested and soybean just beginning to germinate and sprout.

2.2 PALEOENVIRONMENT

At the end of the last glaciation, much of northeastern North America was considerably colder and wetter than at present, with most areas covered by open tundra and boreal forests. Sea level has been estimated as much 130 m below current levels (Milliman and Emery 1968). During this time much of the continental shelf lay exposed and the present-day Chesapeake Bay and Delaware Bay had yet to form, each still consisting of a network of narrow, entrenched river channels. A general warming trend and the subsequent melting and retreat of continental ice sheets brought a rise in sea level, contributing to the flooding of the outer areas of the continental shelf, inundating coastal river systems, and ultimately resulting in the development of inland estuary environments. Northern forests and their associated faunal communities were gradually replaced with varieties more typical of southern temperate zones. By approximately 6500 years BC, climate and environmental conditions were similar to those of today.

These climatic changes did not occur at a smooth, unvarying rate, but rather as a series of short-term variations within a general trend. The potential resource base for prehistoric populations varied over the millennia as different flora and fauna were supported at different times. In the Northeast and Middle Atlantic regions of North America, the major climatic episodes are known as the Late Glacial, Pre-Boreal, Boreal, and Atlantic. All date ranges are taken from *Stability, Storage, and Culture Change in Prehistoric Delaware (*Custer 1984).

Late Glacial 15,000-8,080 years BC. The Late Glacial was a cold and wet period, with tundra-like vegetation present, particularly near the ice front. Further south lay abundant open parkland, with sedge and grass interspersed with stands of spruce and fir (Maxwell and Davis 1972; Wright 1981). It has been argued that a relatively undifferentiated boreal forest environment was in place in the Middle Atlantic region, and that herds of large game prevalent during the Pleistocene were probably not present by the time of the first documented human occupations (Custer 1990:7-8).

Pre-Boreal 8,080-7,350 years BC. While primarily a cold and wet period, the Pre-Boreal saw the retreat of the continental ice sheet, which allowed regional temperature increases and created a gradual warming trend throughout the episode. A mosaic of tundra, open grasslands, and boreal forest provided habitats for a variety of animal species (Carbone 1976:185).

Boreal 7,350-6,450 years BC. Initially, this period was marked by an increase in warm air masses that continued the warming trend of the Pre-Boreal. Open grasslands diminished in extent, and spruce woodlands were replaced by pine forest and northern hardwoods, especially oak (Walker and Hartman 1960; Sirkin 1977). Webb et al. (1994:47) noted an extended period of desiccation in central Delmarva beginning around 11,000 years BP and continuing through the Boreal into the following Atlantic episode. Evidence for this dry period is derived from pond sediments suggesting depressed water levels throughout the period.

Atlantic 6,450-3,110 BC. The early portion of the Atlantic period was characterized by warm and increasingly wet conditions, signaling the onset of a fully modern climatic regime, with associated modern floral and faunal communities. An oak-hemlock complex was well established at the Mitchell Farm site (7NC-A-2), in northern New Castle County, by about 7900 years BP (Custer and DeSantis 1985). Generalized deciduous forests, producing large quantities of mast foods, were in place by 6000 BP, and deer, small mammal, and turkey populations increased (Custer 1989:125).

Sub-Boreal 3,110-810 years BC. The Sub-Boreal consisted of a warm and dry period, with a consequent re-expansion of grasslands and dominance of oak-hickory forests and xerophytic species. The burial of landscapes through aeolian, or windblown, deposition has also been observed throughout the Delmarva Peninsula, and is presumably associated with a combination of xeric soils and drying climatic conditions (Curry 1980, 1992; Ward and Bachman 1987; Curry and Ebright 1989; Daniels 1993). Increasingly cool and moist conditions prevailed near the end of the Sub-Boreal period.

Sub-Atlantic 810 years BC-present. A general, progressive cooling trend is noted throughout the Sub-Atlantic period. A rise in the incidence of organic debris in sediments along the St. Jones River in central Delaware, suggests increased precipitation (Daniels 1993).

2.3 PREHISTORIC AND EARLY HISTORICAL RESOURCE BASE

Understanding the natural environment and its role in Native American and early European settler's lifeways has long been an integral part of descriptive studies in Delmarva, as witnessed by the important and regionally influential work of researchers such as Thomas (et al. 1975) and Custer (1984). Environmental and ecological research has long played an important role in analysis of Delaware prehistory. In general, the Coastal Plain of Delaware presented a productive environment that easily supported prehistoric hunting and foraging populations. A relatively mild coastal climate provided short winters. Soils were fertile, as evidenced in historic times by the state's rich agricultural tradition. A variety of environmental zones occur within a relatively small geographic area in the region. Thomas (et al. 1975) effectively summarized the various zones and the potential resource base offered by each: 1) saltwater bays/ocean; 2) tidal marsh and estuarine environments; 3) well-drained woodlands; 4) poorly drained woods and swamp; and 5) permanent freshwater (rivers/streams).

At present, the northern half of the Delaware Coastal Plain falls within the oak-hickory climax forest type (Braun 1950), and the key species in this forest have been an important component of the local forest cover for the last 6,000 years (Kellogg and Custer 1994:96). The Holocene pollen sequence recorded at the Walter's Puddle bay/basin, located just west of the project area, records an oak-dominated forest, along with vegetation characteristic of bog habitats (Newby et al. 1994:35). The oak-hickory forest, with its characteristic mast or nut production, represented a productive environment, with nutmeats constituting a plentiful and storable human food source that also served as primary seasonal forage for important game species, such as deer, turkey and squirrel.

As potential resource bases, wetlands along the stream margins and bay/basin features, large natural depressions (ponds) that at various times have held water and supported wetland environments, would typically support a variety of vegetation and aquatic and amphibious animals. A number of mammalian species, notably beaver, muskrat, mink, otter, and weasel, live or feed along ponds and wetland fringes. The ponds also would have attracted waterfowl in various seasons. Cattail species and other emergent wetland vegetation would have offered both food resources and useful raw materials. Stream banks and slopes adjacent to open pond margins would have supported forest fringe species, most importantly black cherry (*Prunus serotina*), wild plum (*Prunus americanaI*), and persimmon (*Diospyros virginiana*), which flourish in border areas (Taber 1985), as well as bayberry (*Myrica* sp.). The latter thrive in infertile soil along coastal areas and around the sandy, open rims of brackish-to-freshwater ponds and wetlands (Fernald and Kinsey 1958:146; Angier 1974:30). Mast species would have included sweetmeat hickories, such as the pignut (*Carya glabra*) and mockernut (*Carya alba*) species (Taber 1995). Also, a number of edible plant species known would have been available to the site inhabitants, including paw paw (*Asimna triloba*), hackberry

(*Celtis occidentalis*) (Taber 1995), shadbush (*Amelanchier aborea*) (Sutton and Sutton 1985), and Jack in the Pulpit (*Arisaema sp.)* (Fernald and Kinsey 1958).